PART III

Physical Description

Physical Regions of Washington

On the basis of surface features, Washington may be divided into eight general regions. Agricultural settlement is influenced by factors of topography, climate, soil, forest vegetation and water resources distinctive to each of the physiographic regions. Each has become a different type of farming area as settlers have learned to adapt crops and livestock to the conditions, or have improved limitations through drainage or irrigation.

Coastal Plains

A narrow, sandy plain with shallow bays, tidal flats, stream deltas, and low headlands lies between the coastline and the Coast Range. It extends from the Columbia River mouth almost to Cape Flattery, being widest and lowest in the Grays Harbor and Willapa Bay districts. The climate is mild and damp with a long growing season, but it is too cool, cloudy and wet for most crops. Originally this area was covered with heavy forests and much is now covered with woodlands. Lumbering and manufacture of wood products is the main industry. Farming is largely of the livestock and dairying type on low uplands and drained areas in the lower Chehalis River Valley. Cranberry growing is important and well-adapted to numerous, boggy areas in the Grays Harbor and Willapa Bay sections. The shallow bays are also used for oyster culture. Fishing is common in the rivers and coastal banks.

Coast Range

The Coast Range is an uplifted area of sedimentary and metamorphic rocks divided into the Olympic Mountains and the Willapa Hills. The Olympics tower to nearly 8,000 feet in a dome-like structure, carved deeply by rivers. These mountains have the heaviest precipitation in the state. Snowfields and heavy forest cover the mountains. Most of the wilderness area is within the Olympic National Forest and Olympic National Park, being managed for recreation, wildlife and timber. Farm settlement is limited to some foothill river plains and coastal terraces such as the Dungeness and Port Angeles districts along the Strait of Juan de Fuca. Here in the lee of the mountains, rainfall is moderate and irrigation is practiced by some livestock farmers. The Willapa Hill country is wet, heavily forested and carved into numerous narrow valleys. Logging is the main industry, combined with livestock farming in the upper Chehalis River Valley and along the banks of the Columbia River. Wet climate, hilly topography and the difficulty of clearing stump land retards agriculture.

Willamette-Puget Sound Lowland

A broad lowland, described as a trough or valley, lies between the Coast Range and the Cascade Mountains. The northern part is the Puget Sound Lowland, which has been glaciated and occupied by the sea in the lowest section. The continental glacier reached slightly south of Olympia. Under a warming climate it melted and geologists believe it receded about 25,000 years ago, leaving an infertile plain of moraines and outwash gravels, sands and clays know today

as the Puget Glacial Drift Plain. Its rolling surface has numerous lakes and bogs. Most of the major cities--Seattle, Tacoma, Everett, Bellingham and Olympia--have been built on moraines bordering the Sound. Rivers, such as the Nooksack, Skagit, Snoqualmie, White and Puyallup, built up deltas and flood plains over the older gravelly plains. These narrow valleys are more fertile than the older glacial plains, and support numerous small dairy, vegetable and berry farms. Most of the gravelly areas are wooded with a second-growth forest and are used for pastures. In the southern part of the Willamette-Puget Sound Lowland, there are two large valleys--the Cowlitz and Chehalis. They drain a low, hilly area with several flat prairies and bottom lands.

Agriculture is handicapped by poor drainage and flooding of the river deltas and plains, by heavy winter rainfall, by cloudy but dry summers, by coarse, gravelly upland soils and by densely wooded land which is costly to clear. Advantages are mild climate and a location close to major markets for farm products such as milk, poultry and vegetables.

Cascade Mountains

The Cascades are a wide and high topographic and climatic barrier which separates western and eastern Washington. The range is made up of sedimentary, igneous and metamorphic rocks which have been carved by glaciers and streams. High isolated volcanic cones of lava such as Mt. Adams (12,307 feet), Mt. Rainier (14,408 feet) and Mt. Baker (10,791 feet) appear upon the older Cascade rocks. The Cascade crest varies between 10,000 and 3,000 feet and is higher and more rugged in northern Washington. Roads and railroads have been built across its lower passes in central and southern Washington. The Columbia River has cut a deep gorge and the lowest pass through the barrier. The western slope is wet and heavily forested with Douglas fir. The eastern slope is drier with a less-dense pine forest. Nearly all classified as forest land, most of the area is in Federal ownership in five national forests and Mount Rainier National Park. Tree fruit farming in the eastern slope valleys of Wenatchee, Chelan, Methow, Naches and the Columbia Gorge is most important. Sheep and cattle summer grazing on alpine grasslands is another use. Deep western slope valley bottoms such as the Skagit, Snoqualmie, Nisqually, Cowlitz and Lewis also contain livestock farms. The area is vitally important as a source of water for irrigation and city drinking water and as a source of timber. Steep terrain, wet climate, short growing seasons and heavy forest vegetation are main handicaps for agriculture.

Columbia Basin

A low plateau of old lava rocks covered with stream and wind-deposited soils extends in a series of plains, ridges, coulees and hills from the Cascades to the eastern Washington border. The area is basin-like in structure, being higher around its margins and sloping inward to low and level central plains. It has been sharply eroded by the Columbia River and its interior tributaries, the Snake, Yakima, Palouse and Spokane Rivers. The basin has sub-areas created by crustal movements and erosion.

The Yakima Folds are a series of hilly ridges extending from the Cascades eastward into the lower part of the basin. The Yakima and Columbia Rivers have cut gaps through the ridges and built up plains in the troughs between them. The rich, alluvial plain of the Yakima River is an important irrigated valley.

The Waterville Plateau is a tableland of thin soils overlaying basaltic rock at an elevation of 2,500 to 3,000 feet. It has gorges cut by the Columbia River and ancient glacial outwash streams once flowing in Moses and Grand Coulees. It is too high for irrigation and is used for dryland grain and livestock farming. The high plain is often called the Big Bend country.

The Channelled Scablands is a belt of dry terrain carved by ice-age rivers into a series of coulees. Bare rock is exposed in the coulees. Small plateaus between the old river channels have thin soils used for dryland farming. The Grand Coulee of this region has been developed into a major irrigation reservoir.

The Palouse Hills consist of fertile deposits of wind-blown soil overlaying basaltic lava flows. After being deposited in large dunes, the formation was reshaped by streams into an intricate pattern of low, rounded hills which are tilled for wheat, barley and legumes. The hills receive 16 to 25 inches of rainfall and have deep, porous and fertile soils. It is one of the richest farming areas of the Pacific Northwest.

The Central Plains are low and relatively level expanses of soil, deposited by old streams crossing the Channelled Scablands and later by the flooding of the Yakima, Columbia, Snake and Walla Walla Rivers. Climate is desert-like (6-12 inches of precipitation per year). The lower lands of the area, the Quincy and Pasco Basins and the Walla Walla Valley, are irrigated. Quincy Basin is a new irrigation area watered by Grand Coulee Dam.

Agricultural handicaps in Columbia Basin regions are mainly found in its dry, continental climate. Large irrigation systems built since 1900 have overcome much of the need for water on rich valley and basin soils. Dryland farming in higher areas is practiced widely, although occasional variations in rainfall, lack of snowfall, winter-kill, water and wind erosion inflict damage to field crops and to livestock ranges.

Okanogan Highlands

A portion of the Rocky Mountains, consisting of well-eroded old granites, lavas and sedimentary rocks, extends across north central Washington. These are the Okanogan Highlands, the state's richest mineral area. Summit levels reach 4,000 to 5,000 feet with peaks exceeding 7,000 feet. Prominent north-south valleys are occupied by irrigated tree fruit and livestock farms. These are the Okanogan, Sanpoil, Kettle and Colville Valleys. The Columbia River gorge through the Okanogan Highlands is occupied by the large man-made lake behind Grand Coulee Dam--Roosevelt Lake. High and wetter portions are forested with pine and larch, and are managed for timber and for livestock ranges by the United States Forest Service and the Bureau of Indian Affairs. Cold winter temperatures, short growing seasons, dry valley climates and distance from markets are farming handicaps.

Selkirk Mountains

The Selkirks, a range of the Rocky Mountain system, extend into the northeast corner of Washington. The rocks are old mineralized granites and metamorphics reaching elevations of over 7,000 feet. The Pend Oreille River Valley

at the base of the Selkirks is an agricultural area of narrow bottom lands settled by livestock farmers. Nearly all of the uplands are in Kaniksu National Forest. While climate is cool and growing seasons are short, the Pend Oreille Valley has an advantage of being closely located to the Spokane metropolitan market area.

Blue Mountains

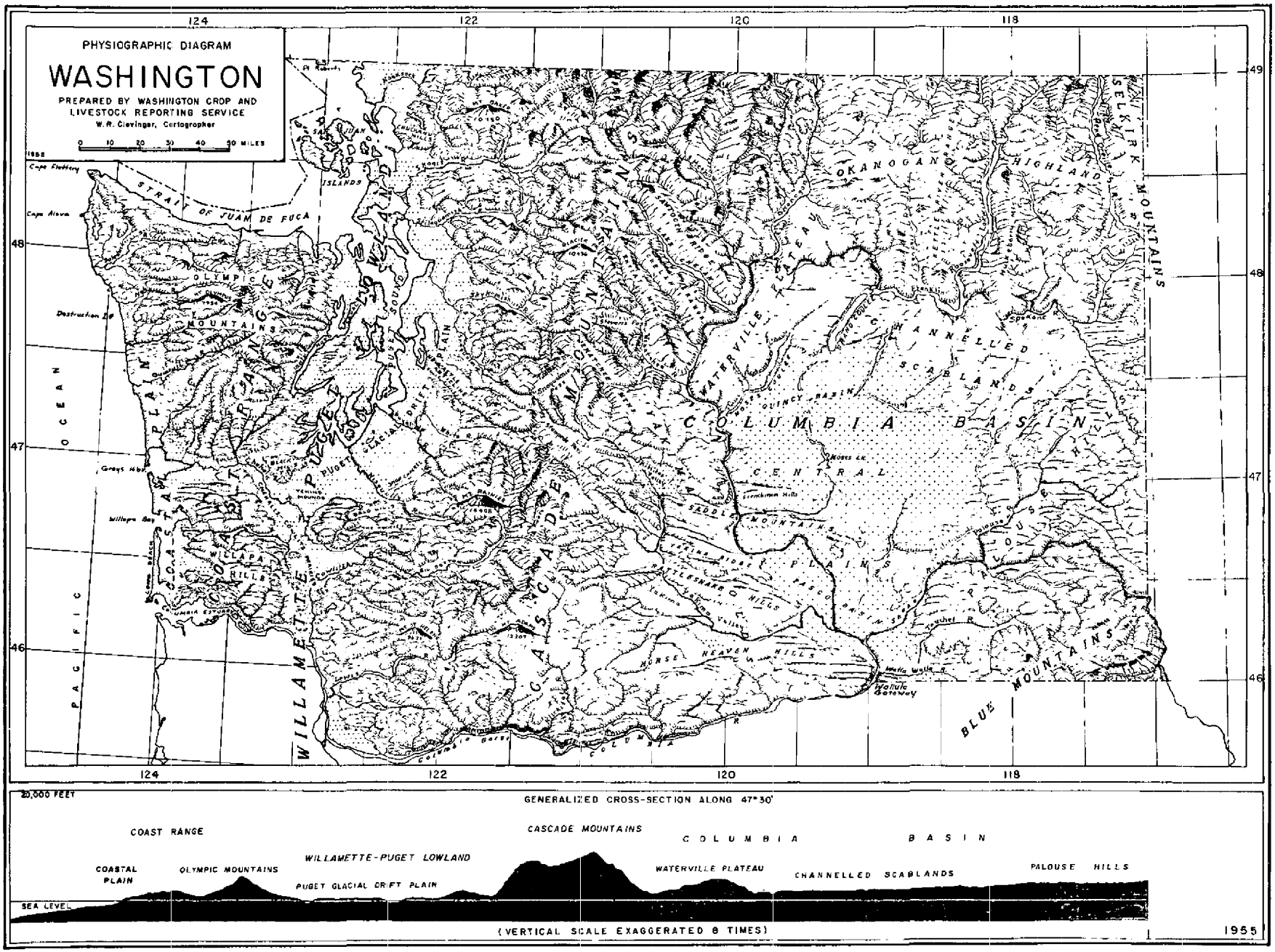
The Blue Mountains are an uplifted and eroded plateau extending into the southeastern corner of Washington. The strata are mainly ancient crystalline rocks which contain some minerals. The highest point of the mountains in the Washington section is Diamond Peak (6,401 feet), on the divide between the Grande Ronde, Tucannon and Touchet Rivers. These rivers, and the Walla Walla River, have cut valleys into the plateau. Extensive pine forest and grassland areas are in the highlands within Umatilla National Forest, where rainfall is 30 to 40 inches. The Snake River has cut a deep valley and gorge across the lower parts of the mountains. The area is well developed agriculturally around its northern foothills where wind-blown soils are deep and irrigation systems are used. The Walla Walla and Tucannon Valleys are rich grain, legume and livestock areas grown under irrigation and by dry farming. Grazing is an important use of the high lands by livestock ranchers in the upper valleys.

Topography of Wahkiakum County

Wahkiakum County is almost entirely within a section of the Coast Range called the Willapa Hills. The major features of its topography have resulted from the cutting of the Columbia River across the Coast Range. Physiographers believe that the Columbia River has managed to cut and maintain its course to the sea as the Coast Range has slowly risen through a warping of the earth's crust. Heavy rainfall, creating many minor tributaries and rivers, has eroded the Willapa Hills portion of the Coast Range into numerous small valleys and creek bottoms. Valleys of the Deep River, Grays, Skamokawa and Elokomin Rivers are deposits of silty and sandy soil washed down from the sedimentary rocks making up the rough hills in the northern part of the county. Elevations vary from sea level at Grays Bay to 2,600 feet in the interior. Hilly land, not suited to cultivated crops, makes up about two-thirds of the county's 172,160 acres.

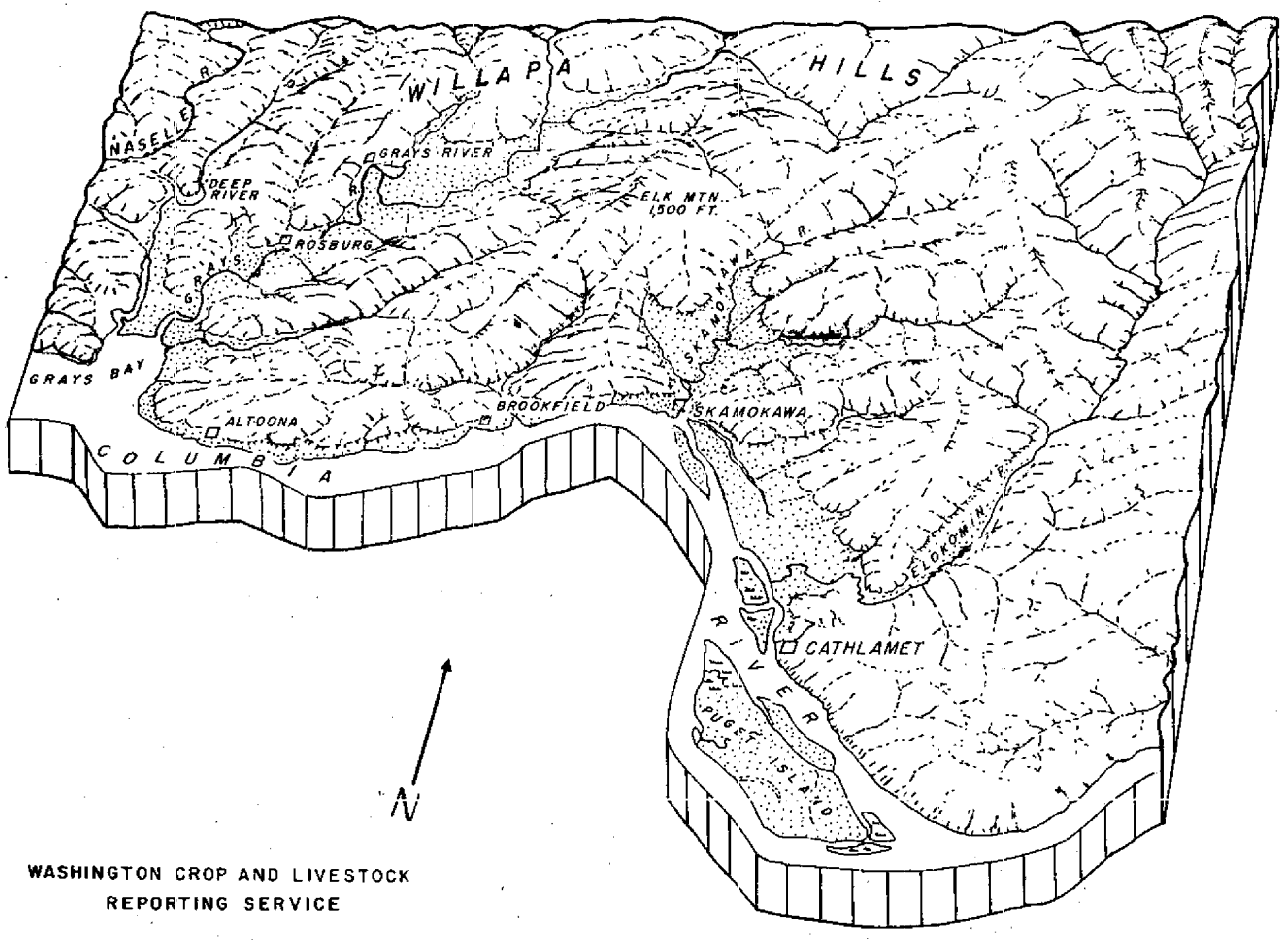
Through its meandering course and periodic flooding, the Columbia River has created benches along the Wahkiakum shore. Slightly above flood level and overlooking the river, the towns of Cathlamet, Skamokawa, Brookfield and Altoona are built on these old river banks. The Columbia River bank of eastern Wahkiakum County is steep and cliff-like between Eagle Cliff and Cathlamet. There the bank slopes up steeply to 1,000 feet and over.

The river has deposited Puget Island in the middle of its course just south of Cathlamet. This is the largest flood plain island in the estuary of the Columbia River. It is about six miles long and two miles wide and is protected from the cutting of the river by diking and dredging of the Cathlamet Channel to the north and Wauna Channel on the Oregon side. Puget Island is connected to the Wahkiakum mainland by a bridge. Smaller river islands, Hunting and Price Islands, have been deposited at the mouths of the Elokomin and Skamokawa Rivers.


PHYSIOGRAPHIC DIAGRAM
WASHINGTON
PREPARED BY WASHINGTON CROP AND LIVESTOCK REPORTING SERVICE
W. R. Clevinger, Cartographer
0 10 20 30 40 50 MILES
1955
124
122
120
118
49
48
47
46
PACIFIC OCEAN
STRAIT OF JUAN DE FUCA
SAN JUAN ISLANDS
OLYMPIC MOUNTAINS
COAST RANGE
PUGET SOUND
WILLAMETTE-PUGET LOWLAND
PUGET GLACIAL DRIFT PLAIN
WILLAPA HILLS
CASCADE MOUNTAINS
OKANOGAN HIGHLAND
SELKIRK MOUNTAINS
COLUMBIA BASIN
WATERVILLE PLATEAU
QUINCY BASIN
CHANNELLED SCABLANDS
CENTRAL PLATEAU
SADDLE MOUNTAINS
PALOUSE HILLS
PASCO BASIN
RATTLESNAKE HILLS
HORSE HEAVEN HILLS
BLUE MOUNTAINS
Spokane
Walla Walla
Wallula Gateway
Yakima
Columbia R.
GENERALIZED CROSS-SECTION ALONG 47°30'
20,000 FEET
COAST RANGE
CASCADE MOUNTAINS
COLUMBIA BASIN
COASTAL PLAIN
OLYMPIC MOUNTAINS
WILLAMETTE-PUGET LOWLAND
PUGET GLACIAL DRIFT PLAIN
WATERVILLE PLATEAU
CHANNELLED SCABLANDS
PALOUSE HILLS
SEA LEVEL
(VERTICAL SCALE EXAGGERATED 8 TIMES)

WAHKIAKUM COUNTY

TOPOGRAPHIC DIAGRAM



WASHINGTON CROP AND LIVESTOCK
REPORTING SERVICE

W.R. Clevinger 1955

In this section of its course the Columbia River is slowed by tidal currents, and there it deposits vast amounts of rich sediment carried out of the interior of the Pacific Northwest. The Corps of Engineers is kept busy keeping ship channels open.

Climate

Wahkiakum County has the cool, wet climate common to the counties located in the Coast Range of Washington and Oregon. The area is near the ocean and is in the zone of prevailing, moist southwesterly winds. For nine months of the year, these winds keep temperatures mild and bring heavy rainfall as they rise over the Willapa Hills. Seldom is the county visited by cold, dry air coming out of the interior of the continent. Climatologists place the county in a climatic region called the West Coast Marine Region which is a strip of cool, moist climate, influenced by ocean air, extending from southeastern Alaska to northern California. This same climate is found along the coast of northwestern Europe from Norway to Spain, and in the southern hemisphere it occurs along the coast of southern Chile and again in New Zealand. In world trade the lands which have this climate are noted for their forests and dairy products.

The influence of the Pacific Ocean gives the climate of Wahkiakum a moderate range of mild temperatures. Only occasionally are there periods of extreme cold or excessive heat. The lower air is nearly of the same even temperatures which exist over the northern Pacific Ocean. For the county as a whole, temperatures average from 36 to 40 degrees Fahrenheit in January and from 60 to 64 degrees Fahrenheit in July. Long periods of below-freezing temperatures which damage crops and pastures seldom occur. Light frosts may occur in the valley lowlands during the winter. Temperatures of the higher elevations in the Willapa Hills are cool enough in midwinter to cause snow. Possible sunshine and warmer temperatures during midsummer are reduced by coastal fogs. These fogs flow up the Columbia estuary frequently from the ocean fog banks which build up during the summer off the California, Oregon and Washington coast.

Although the county has a relatively long growing season free of frosts, the low rate of sunshine and the general coolness of the weather slow the rate of crop growth. The growing season averages over 200 days in the farmland areas and varies slightly from east to west. The season is shorter in the eastern section at Cathlamet, Puget Island, Skamokawa and Elokomin Valleys where the first frost of fall occurs about November 1 and the last one in spring about April 10. In the more western part nearer the ocean, including the Grays and Deep River Valleys, frost is less frequent. Here the first frost normally comes about November 20 and killing frosts do not generally happen after March 20. These temperature conditions are good for grass farming and dairying, but are only fair for making hay or growing crops which need a large amount of sunshine and warmth to mature.

Precipitation in the form of rain and some snow is heavy over all of the county, ranging from 55 to over 90 inches per year. The higher country in the Willapa Hills is much wetter than the lowlands along the Columbia River. Moisture-laden, westerly winds blowing up the estuary of the river drop moisture rapidly as they are forced upward by the Coast Range. The land is much cooler than the ocean during the winter months and all air moving inland generally creates rain and drizzle. The land is warmer than the ocean surface in the

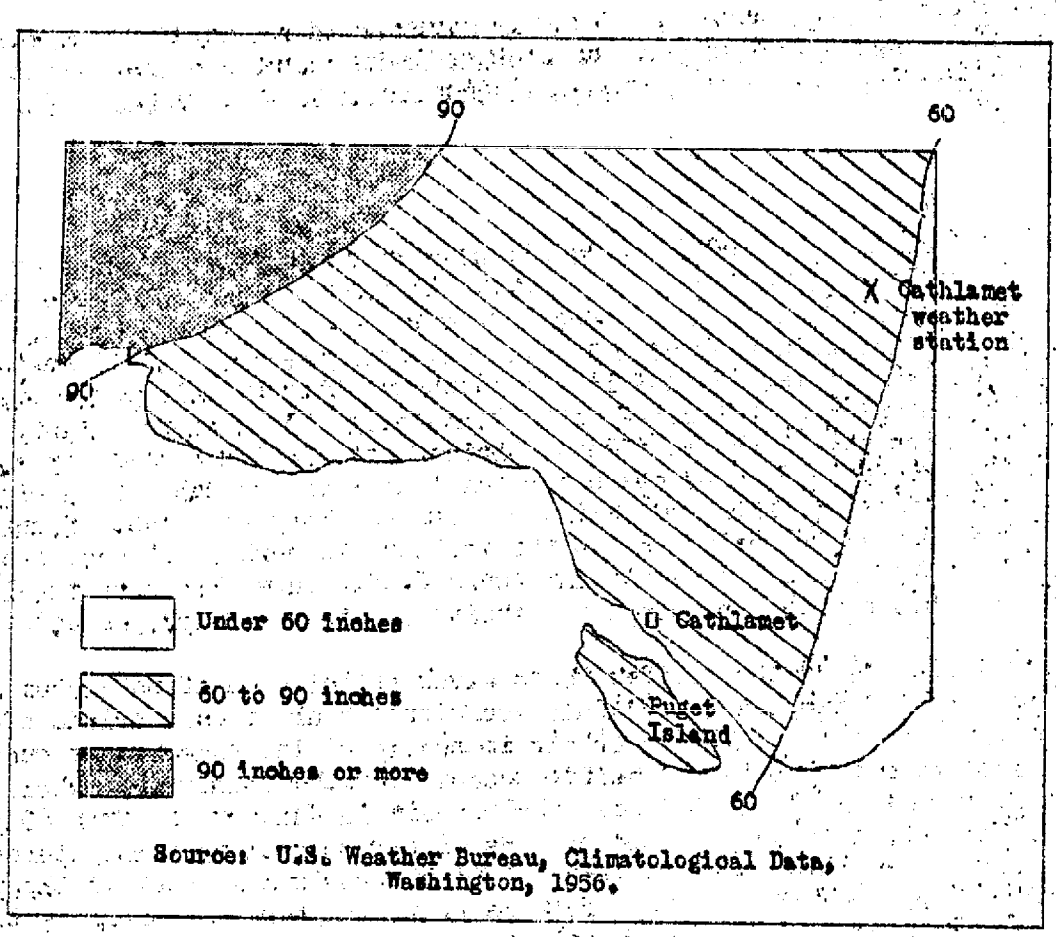
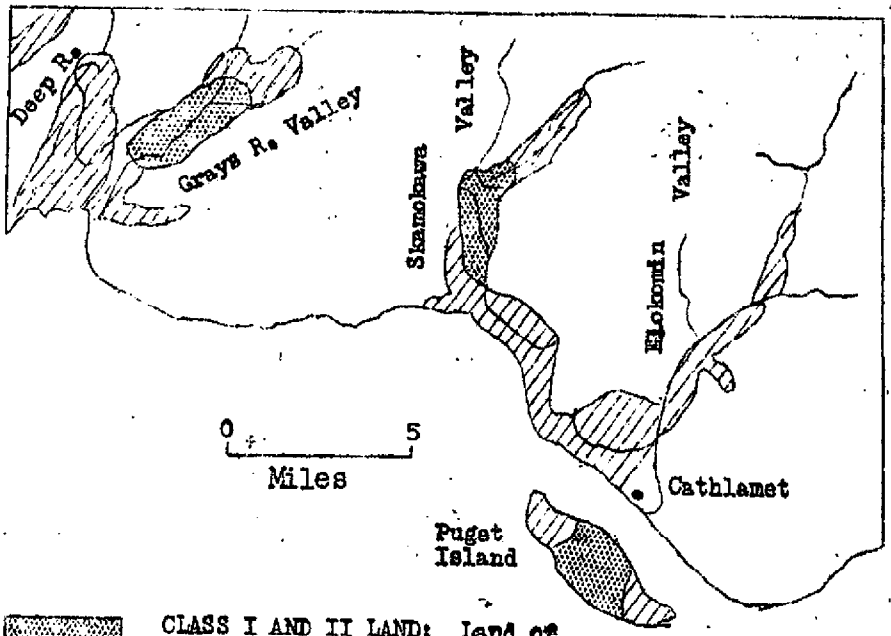


Figure 6.- Distribution of Precipitation
Wahkiakum County

summer and the maritime air which flows inland from the Pacific is warmed instead of cooled. When air is warmed it expands and can hold more moisture, therefore, rain is not frequent during midsummer. This reversal of land temperature conditions during the year creates a wet and dry season. The fall, winter and spring (September to May) is a wet season. Midsummer in July and August is distinctly dry. The dry season is utilized for making hay. The dryness of midsummer also creates a forest fire hazard and farmers in the county are often employed part-time in protecting forest lands which make up most of the county's area.

Table 5.- Precipitation for Selected Stations By Months
Wahkiakum County
(Source: United States Weather Bureau)

Station and Elevation in Feet	Average Monthly Precipitation (in inches)												Annual Total (inches)
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
Cathlamet (476)	11.35	9.01	12.93	5.40	3.62	2.76	1.25	1.66	2.79	6.90	10.85	13.89	80.81



CLASS I AND II LAND: Land of high and better-than-average productivity with good levels of net income per farm.

CLASS III, IV AND V LAND: Land of average, limited and low productivity because of poor drainage, hilly topography and poorer soils. Net income per farm ranges from low to average.

CLASS VI, VII AND VIII LAND: Land not suited for farming. Includes hilly, mountainous terrain supporting forests.

Generalized from a land capability map of Washington State, U.S. Department of Agriculture, Soil Conservation Service, Popular Bulletin No. 200, December 1950. Pullman, Washington: The Institute of Agricultural Sciences, State College of Washington.

Figure 7.- General Quality of Land in Wahkiakum County

Land Classification and Soils

The land of Wahkiakum County is divided into eight general classes by a system used by the United States Soil Conservation Service. The soils of these lands can further be grouped into eleven general types as mapped by soil scientists of the United States Department of Agriculture. Because of the predominance of the Coast Range the greater part of the county's area is made up of the non-agricultural classes of land. However, this rough land is well suited to tree growth and forests because of its moderate elevation and heavy rainfall. The classes of farmland ranging from Class I to V are localized on Puget Island and in the lower lands of the Elokomin, Skamokawa, Grays and Deep River Valleys. With the exception of Puget Island, level land is not common and most of the land which is farmed has slopes of various degree.

Class I and II lands which have the most productive farms are located on Puget Island, the lower portion of the Skamokawa Valley, and most of the Grays River Valley. Puget Island has over 3,000 acres of this good land and is the most single important farming section of the county. Grays River Valley is second in importance with about 2,500 acres of good land. On Puget Island the soil is classified as Sacramento silty clay loam. Deposited by the Columbia River, it is fine-textured but requires drainage and diking to be farmed. Chehalis silty clay loam is the second most common soil of the class one and two lands. It makes up most of the farmland in the Elokomin, Skamokawa and Grays River Valleys. Chehalis silty clay is in the fields of the lower Grays River and Deep River adjoining Grays Bay.

Most of the sloping and hilly Class III, IV and V lands make up the rougher areas between the valley plains. Soils of the hill lands are commonly Melbourne silty clay loam, Olympic stony clay loam, Olympic stony loam and Olympic silt loam. Lauren silt loam is found in the vicinity surrounding the town of Cathlamet. This soil supports an area of hill farming directly above Cathlamet, the only such area farmed in the county. Most of the higher part of the county has poor soils which contain sand, clay, gravel or rock in excessive amounts.

Forests and Wildlife

Since first settlement in 1846, man has changed the natural vegetation considerably. Before lumbering and farming operations began, practically all the area was forested. Most of the original or virgin forest was cut-over by 1950. Today most of the coniferous forest is young regrowth locally called "second growth" timber. However, there are areas upon which the original timber is still growing. The divide between the Grays and Skamokawa Rivers still has virgin timber of Sitka spruce, western hemlock, Douglas fir and western red cedar. Recently cut-over areas are restocked with young timbers and saplings of these species.

In 1940 the Forest Service classified the forest land according to species and relative growth. The surveyors listed 118,000 acres as spruce-hemlock (the most important type of forest), 33,000 acres as Douglas fir and 6,670 acres as hardwood (red alder, broadleaved maple, cottonwood and other species. Foresters report that Wahkiakum County land has a high capacity to grow timber. Its forest soils are deep and receive heavy amounts of precipitation. These conditions are good fro growing hemlock, spruce and Douglas fir as a crop for lumber and pulpwood manufacturing.

In contrast to other western Washington counties most of the forest land is privately owned and a large portion of this is managed as tree farms. These farms grow timber as a perpetual crop which is mainly harvested as pulpwood and small sawtimber logs. According to data of the U.S. Forest Service collected in 1950, forest ownership in Wahkiakum County totaled 144,650 acres. Private ownership included 108,760 acres, or 75 percent. Public lands, mainly school lands, included 34,780 acres or 23.6 percent. In the past, as in the present and in the future, the forest resources have and will continue to be the main support of the county's population. Forestry and sale of minor forest products from farm woodlands will continue to become more important with the passing of time. Forest products of farms show a rapid increase in value. In 1945 they

were estimated at only $752 dollars from all farms but in 1950 the U.S. Agriculture Census estimated a value of $24,059 and in 1954 a three-times-greater value of $80,649.

Fish and wildlife resources are important to the county and state for recreation as well as some income from sportsmen. With over two-thirds of the land under forest management, fishing and hunting are important recreational forms of using the land. Commercial and sports fishing continues as a major activity even though salmon and smelt runs have declined and state laws of Washington have prohibited the use of seines and traps since 1934. The combination of fishing and farming is a distinctive feature. In 1950 the Wahkiakum County assessor recorded that residents of the county owned 94 private boats used for fishing. Fish packing companies owned 56 vessels.

Important commercial and game fish resources include salmon, steelhead and smelt which run up the Columbia River. Recently steelhead became exclusively a game fish. Chinook salmon is the most important species, but has declined in value greatly since 1930. Columbia River bars are opened year around for steelhead and cutthroat trout. The Grays, Elokomin and Skamokawa Rivers are good for steelhead and trout from May to October. Spiny Ray are caught during summer at Steamboat Slough. Smelt fishing is active along the shores of Puget Island in February and March. During the 1952-53 season sportsmen caught 3,224 steelhead from the Columbia River waters in Wahkiakum County and 1,193 from the Grays River.

Farmers also realize recreation and some income from upland hunting and trapping. In the 1954 season the forested highlands yielded 1,000 deer. About fifty trappers in the county catch over 1,000 muskrat, 75 mink and 25 otter each winter.

Table 5.- Wahkiakum County's Rank Compared With Other Washington Counties

Item Compared	Rank	Quantity	Year
General			
Land area	37	172,160 acres	1954
Number of farms	34	376 farms	1954
Land in farms--percent	22	19.3 percent	1954
Average size of farms	29	88 acres	1954
Cropland harvested	36	4,799 acres	1954
Rural farm population	32	1,658 persons	1950
Total county population	37	3,835 persons	1950
Cash farm income			
Value of all farm products sold	32	1,469,551 dollars	1954
Value of livestock sold	25	1,304,040 dollars	1954
Value of crops sold	36	84,862 dollars	1954
Livestock on farms			
All cattle and calves	31	10,000	1956
Milk cows	16	4,800 head	1956
Hogs	39	57 head	1954
Chickens	39	6,969 birds	1954
Horses and mules	39	59 head	1954
Sheep and lambs	37	157 head	1954
Dairy and poultry products sold			
Value of dairy products sold	16	1,055,300 dollars	1954
Whole milk sold	16	24,917,000 pounds	1954
Value of poultry products sold	37	23,253 dollars	1954
Chickens sold	38	2,709 birds	1954
Eggs sold	38	37,630 dozen	1954
Important crops harvested			
Clover and timothy	13	2,900 acres	1955
Grass silage	15	972 acres	1954
Cucumbers and vegetables	21	330 acres	1956
Mint	6	285 acres	1954

Sources: U.S. Censuses of Agriculture, 1950, 1954.
U.S.D.A., AMS, Agric. Estimates Division, State of Washington